flushing the surface of the substrate with oxygen within the reaction chamber so as to uniformly terminate dangling bonds on the surface of the substrate with oxygen atoms at a substrate temperature of 120 to 370 °C;

chemically adsorbing a first reactant onto the terminated surface of the substrate by introducing the first reactant into the reaction chamber;

forming a film of an oxide material as a result of a chemical exchange or reaction of the chemically adsorbed first reactant and a second reactant by introducing the second reactant into the reaction chamber, wherein the oxide material includes of the oxygen atoms used to terminate the surface of the substrate.

Kindly add the following new Claim 27:

27. (New) The method of claim 15, wherein the substrate temperature is about 300 °C.

REMARKS

Summary

By this Amendment, Claim 15 has been amended to recite the substrate temperature during flushing as being 120 to 370 °C, and new dependent Claim 27 as been added which recites the substrate temperature as being about 300 °C.

Support for the new limitations can be found in the present specification at page 9, line 14, through page 10, line 11.

Accordingly, Claims 15-27 are now pending in the application.

Election/Restriction

New dependent Claim 27 corresponds to both the elected species "B" (single atomic oxide) and the non-elected species "C" (composite oxide), and accordingly, Applicants believe this claim should not be withdrawn from consideration.

35 U.S.C. ¶103

Claims 15-26 were rejected under 35 U.S.C. ¶103 as being anticipated by Kim et al. in view of Marcus et al. '579 and Marcus '751 and/or Comizzoli et al., for the reasons stated at pages 2-4 of the Office Action. Applicants respectfully traverse this rejection with respect to the now-pending Claims 15-27.

Initially, Applicants strongly object to the following characterization by the Examiner of Applicants' previous argument:

> "In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually

where the rejections are based on combinations of references."

Applicants did not attack the references individually, and in fact, Applicants put forth a compelling argument against the combination of references, to which the Examiner has failed to offer any response whatsoever in the final Office Action.

The Examiner's rejection (to the best of Applicants' understanding) is based on the proposition that it would be obvious to modify Kim to terminate the substrate surface with oxygen instead of hydrogen in view of the teachings of Marcus et al. However, as pointed out in Applicants previous response, such a modification is completely contrary to the teachings of Kim. The Examiner has not considered the Kim article as a whole.

Again, Kim et al. teaches pretreatment of the substrate surface so as to **remove** particles and **native oxides** by chemical treatment and etching using **hydrofluoric acid (HF)**. This **cleaning treatment results in the substrate surface being terminated with hydrogen**. In particular, Kim et al. states:

"Prior to the growth of Al2O3 films, the native oxide covered substrate, Si(100), was cleaned by the conventional wet chemical treatment and diluted HF etching treatment in sequence for the removal of

> particles and native oxides, respectively. The surface of the Si prepared in this manner is known to be contamination-free and terminated with atomic hydrogen." (Emphasis added.)

Accordingly, **an objective of the pretreatment of Kim et al. is to remove oxides**. Further, the **termination of the Si surface with atomic hydrogen is a by-product of the etching process using HF**.

In the Office Action, the Examiner states:

> "[I]t would have been obvious to ... have initially terminated the surface of the silicon substrate of Kim with oxygen instead of hydrogen with the expectation of similar results." (Emphasis added.)

This statement is not persuasive since Kim etches the substrate surface with hydrofluoric acid the expectation of (a) removing oxides and (b) terminating with hydrogen.

An objective of Kim is to remove native oxides in the pretreatment thereof, and hydrofluoric acid is used for this purpose. The terminated hydrogen is a by-product of the etching with hydrofluoric acid, it would not be obvious from the teachings of Marcus et al. to somehow terminate with oxygen instead.

Applicants should also note that Kim is directed to atomic layer deposition (ALD). As suggested in the first column of the Kim reference, there are substantially distinctions between ALD and "conventional technologies", such as those represented by the Marcus et al. patents. As is generally known in the art, conventional techniques can not be readily adapted to Kim's ALD process.

In an effort to expedite prosecution and to even more clearly define over the cited references, Applicants have amended Claim 15 to recite a substrate temperature during flushing of 120 ˚C to 370 ˚C. As explained at page 10 of the present specification, termination of the substrate surface with oxygen atoms at a temperature of 120 ˚C to 370 ˚C is desired to decompose both the silicon and the CH3 radicals of the subsequently supplied first reactant. New dependent Claim 27 recites the substrate temperature to be 300 ˚C.

For *at least* the reasons stated above, Applicants respectfully contend that Claims 15-27 would not have been obvious to one of ordinary skill in art in view of the teachings of the cited references, taken individually or in combination.

Conclusion

No other issues remaining, reconsideration and favorable action upon the Claims 15-27 now-pending in the application are requested.

Respectfully submitted,

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ATTACHMENT "A"

Additions/Deletions to Claim 15:

15. (Amended) A method for forming an oxide film on the surface of a silicon substrate, comprising:

loading the substrate into a reaction chamber;

flushing the surface of the substrate with oxygen within the reaction chamber so as to uniformly terminate dangling bonds on the surface of the substrate with oxygen atoms <u>at a substrate temperature of 120 to 370 °C</u>;

chemically adsorbing a first reactant onto the terminated surface of the substrate by introducing the first reactant into the reaction chamber;

forming a film of an oxide material as a result of a chemical exchange or reaction of the chemically adsorbed first reactant and a second reactant by introducing the second reactant into the reaction chamber, wherein the oxide material includes of the oxygen atoms used to terminate the surface of the substrate.